US009111170B2

(12) **United States Patent**
Tsai et al.

(10) **Patent No.: US 9,111,170 B2**
(45) **Date of Patent: Aug. 18, 2015**

(54) **METHODS AND APPARATUS RELATING TO TEXT ITEMS IN IMAGES**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/091,195**

(22) Filed: **Nov. 26, 2013**

(65) **Prior Publication Data**

US 2015/0146982 A1 May 28, 2015

(51) **Int. Cl.**
G06K 9/34 (2006.01)
G06F 3/048 (2013.01)

(52) **U.S. Cl.**
CPC ***G06K 9/344*** (2013.01); ***G06F 3/048*** (2013.01); *G06K 2209/01* (2013.01)

(58) **Field of Classification Search**
USPC 382/177, 176, 312, 318, 319; 235/383; 348/150, 570; 1/1; 704/2, 3, 7; 705/7.11, 7.42, 325; 715/711, 808, 715/715, 765, 835, 704
See application file for complete search history.

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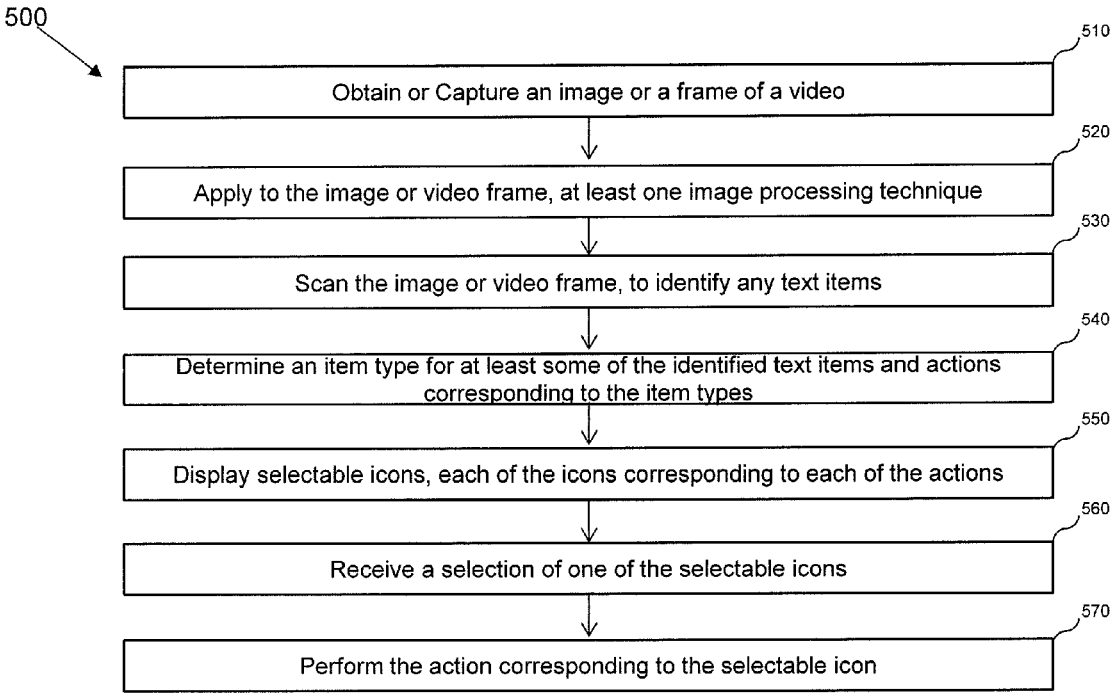
Primary Examiner — Anh Do
(74) *Attorney, Agent, or Firm* — Jon Gibbons; Fleit Gibbons Gutman Bongini & Bianco P.L.

(57) **ABSTRACT**

A method and an electronic device are provided for obtaining an image or a video frame, including applying to the image or the video frame, at least one image processing technique, scanning the image or the video frame, to identify a text item, determining an item type for the identified text item, and determining an action, corresponding to the item type.

21 Claims, 12 Drawing Sheets



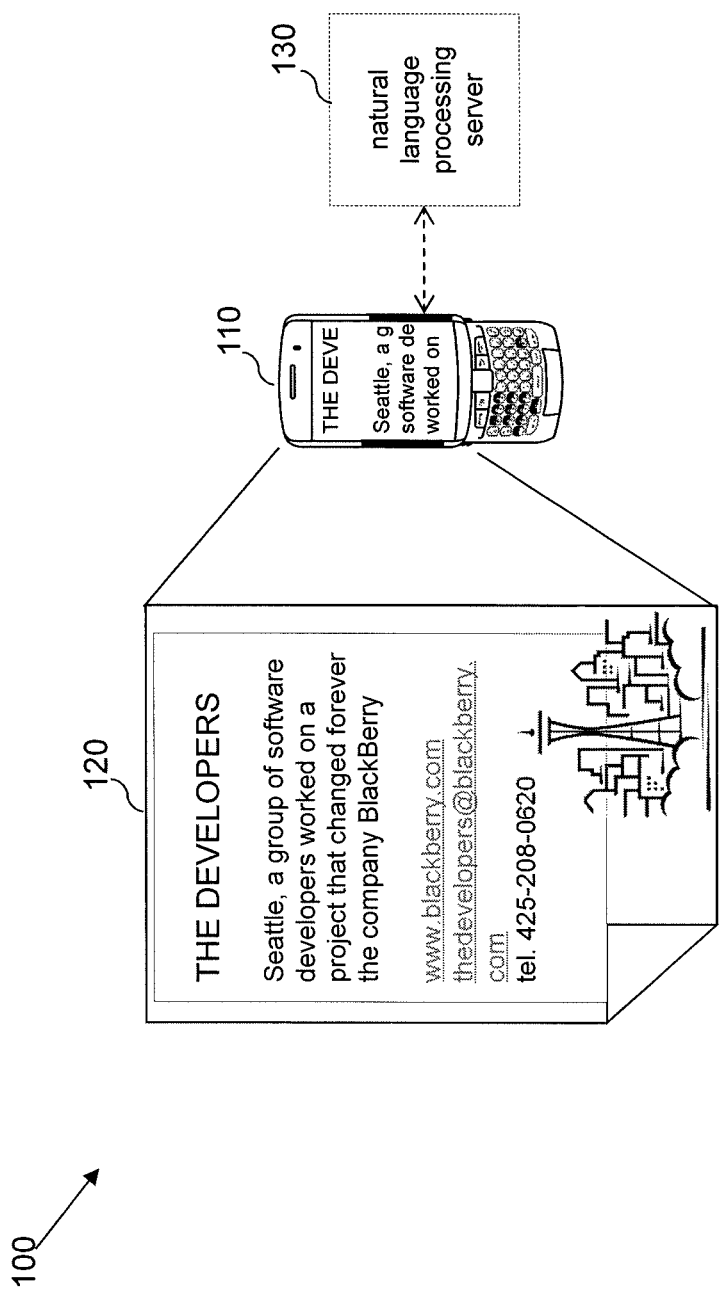

100
120
THE DEVELOPERS
Seattle, a group of software developers worked on a project that changed forever the company BlackBerry
www.blackberry.com
thedevelopers@blackberry.com
tel. 425-208-0620
110
THE DEVE
Seattle, a g
software de
worked on
130
natural language processing server

FIG. 1

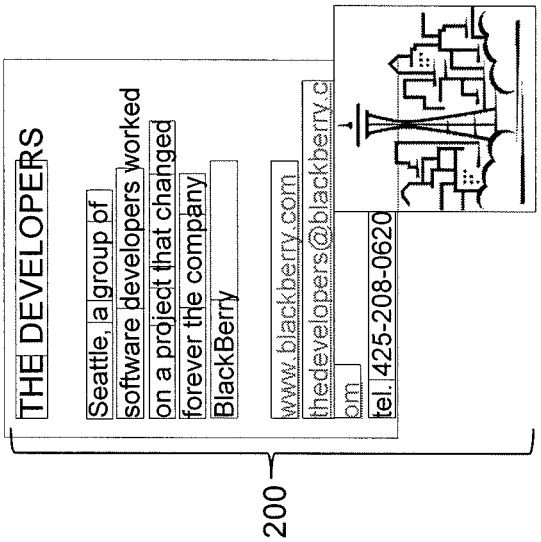

THE DEVELOPERS
Seattle, a group of
software developers worked
on a project that changed
forever the company
BlackBerry
www.blackberry.com
thedevelopers@blackberry.c
om
tel. 425-208-0620
200

FIG. 2

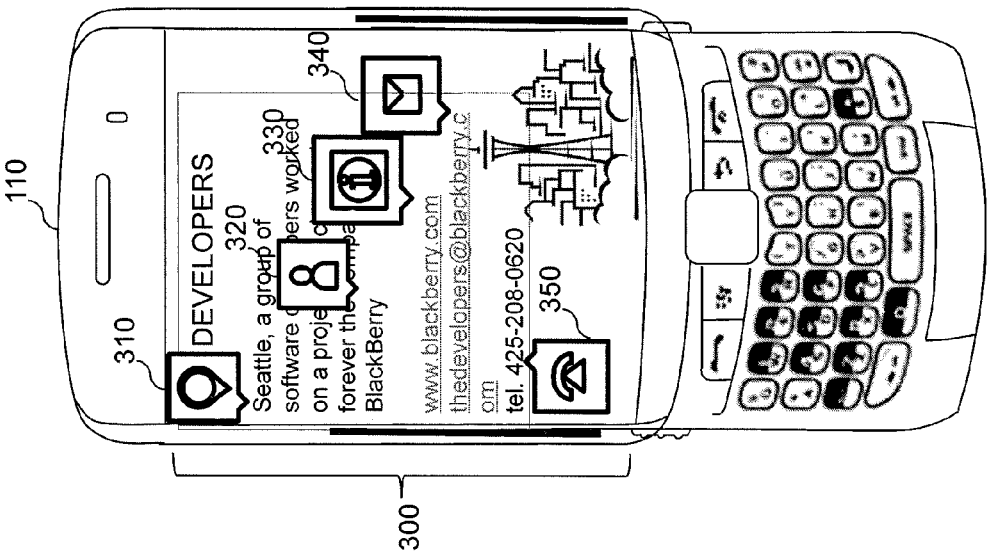

110
310
DEVELOPERS
320
330
340
350
www.blackberry.com
thedevelopers@blackberry.com
tel. 425-208-0620
300

FIG. 3

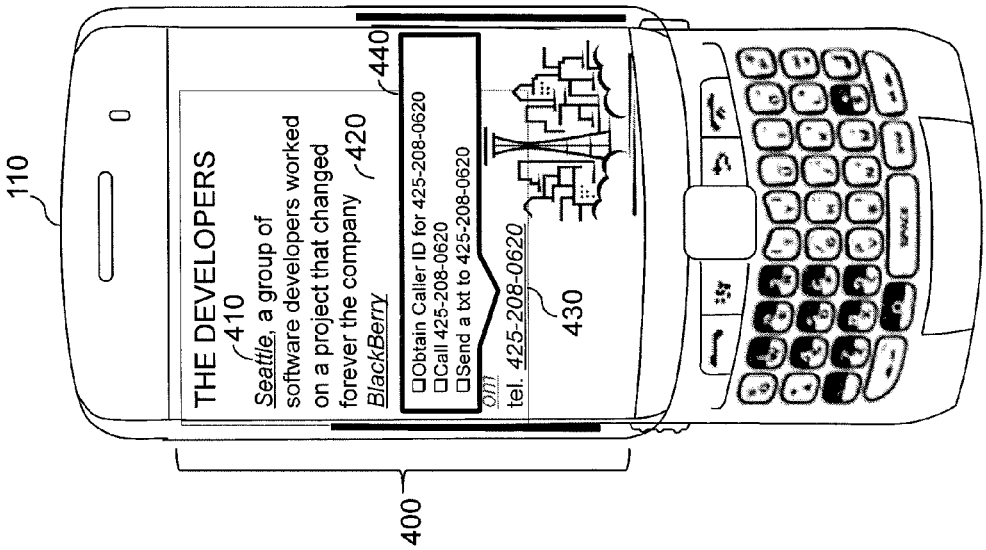

110
THE DEVELOPERS
410
Seattle, a group of
software developers worked
on a project that changed
forever the company
BlackBerry
420
440
Obtain Caller ID for 425-208-0620
Call 425-208-0620
Send a txt to 425-208-0620
om
tel. 425-208-0620
430
400

FIG. 4

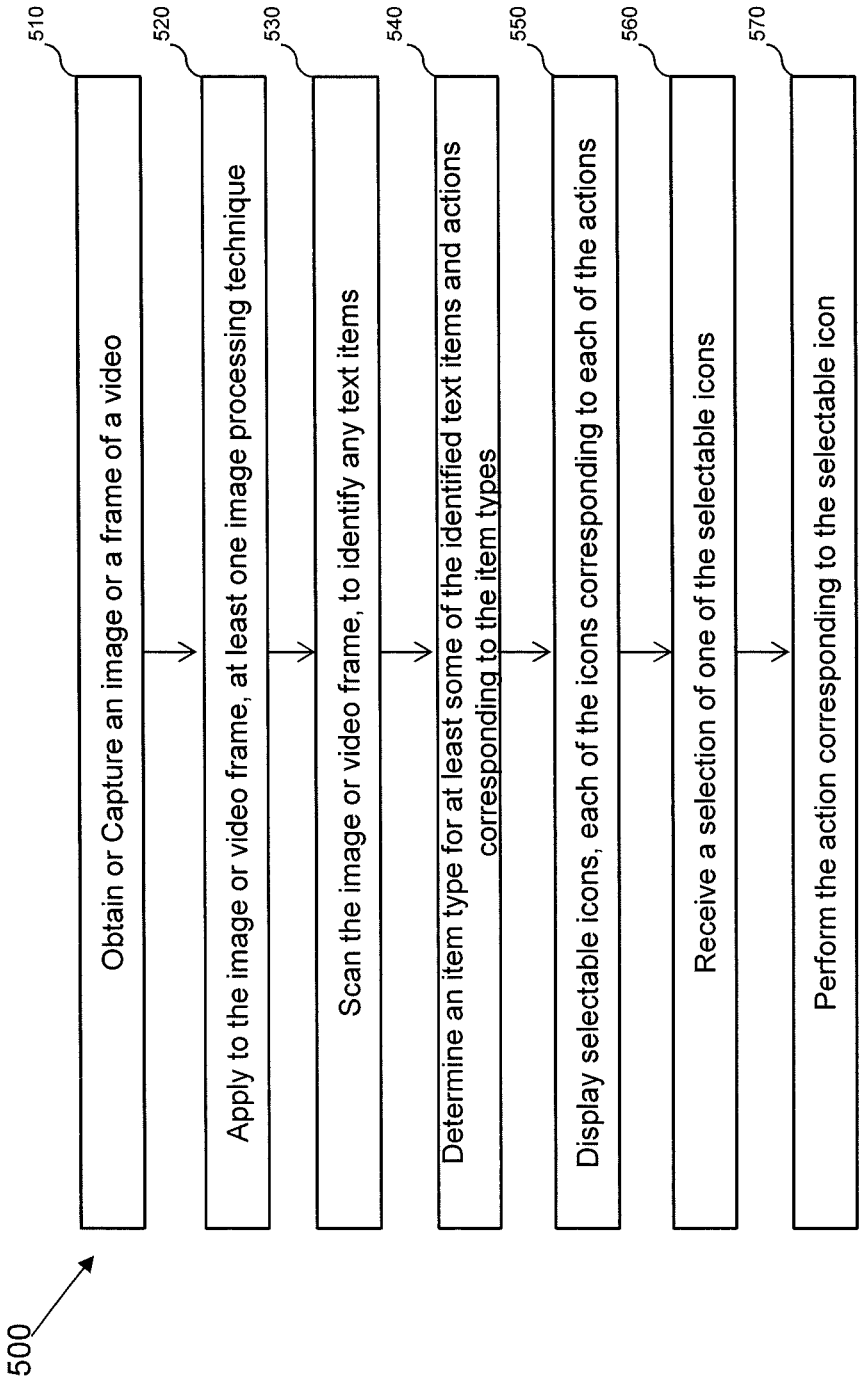

500
510
Obtain or Capture an image or a frame of a video
520
Apply to the image or video frame, at least one image processing technique
530
Scan the image or video frame, to identify any text items
540
Determine an item type for at least some of the identified text items and actions corresponding to the item types
550
Display selectable icons, each of the icons corresponding to each of the actions
560
Receive a selection of one of the selectable icons
570
Perform the action corresponding to the selectable icon

FIG. 5

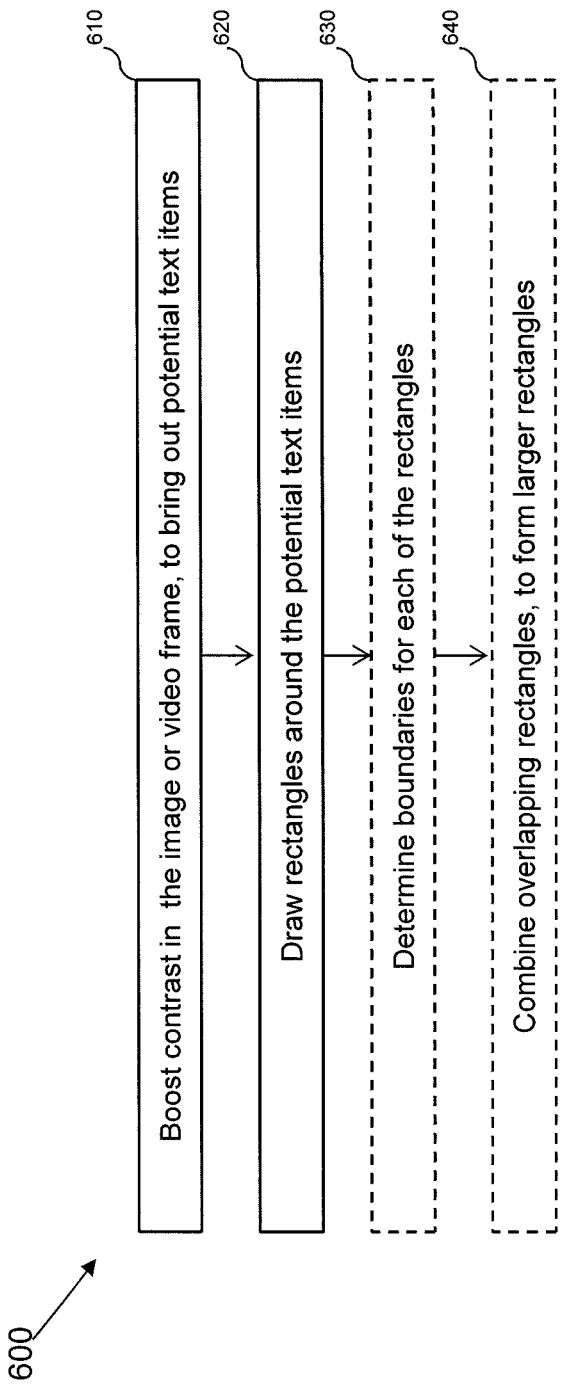

600
610
Boost contrast in the image or video frame, to bring out potential text items
620
Draw rectangles around the potential text items
630
Determine boundaries for each of the rectangles
640
Combine overlapping rectangles, to form larger rectangles

FIG. 6

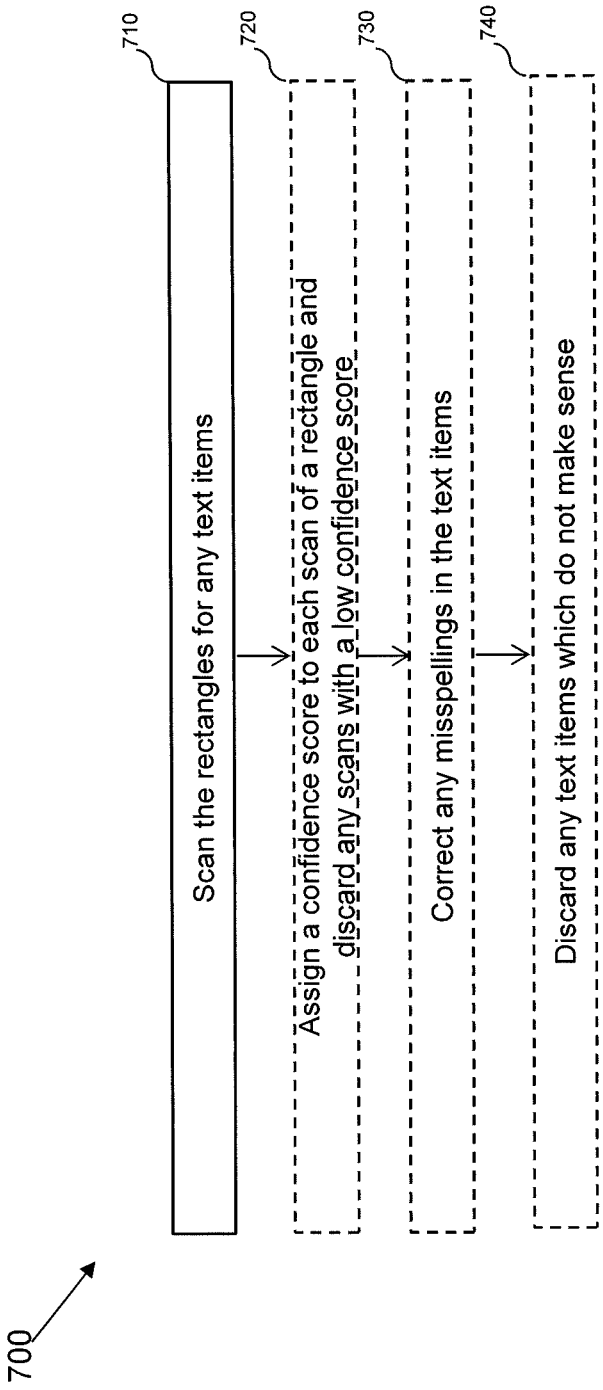

700
710
Scan the rectangles for any text items
720
Assign a confidence score to each scan of a rectangle and discard any scans with a low confidence score
730
Correct any misspellings in the text items
740
Discard any text items which do not make sense

FIG. 7

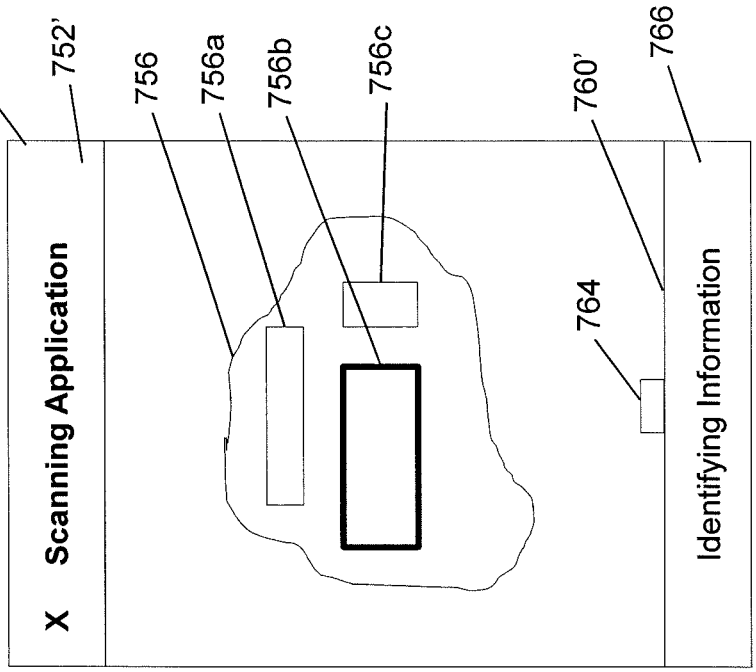

750
752'
756
756a
756b
756c
760'
766
X Scanning Application
764
Identifying Information

FIG. 9

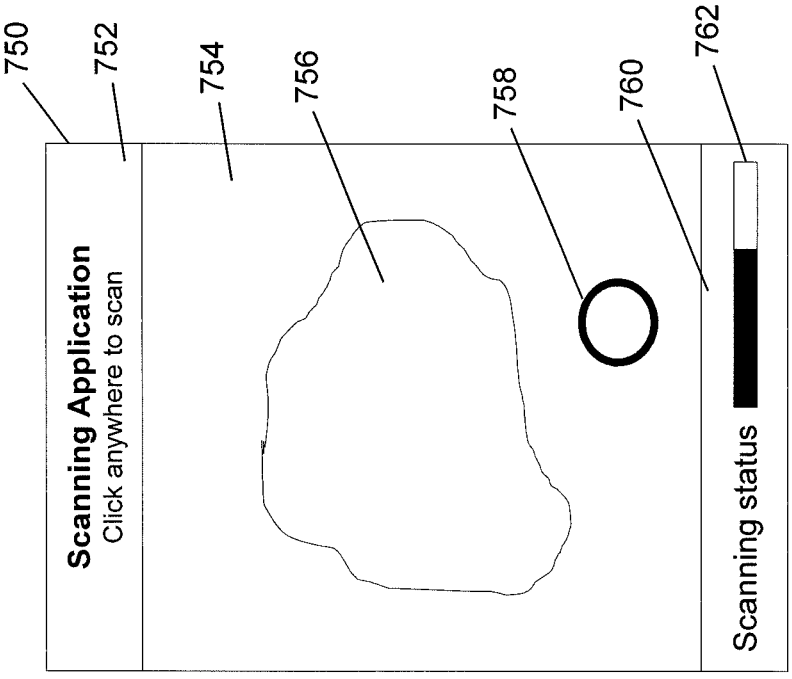

750
752
754
756
758
760
762
Scanning Application
Click anywhere to scan
Scanning status

FIG. 8

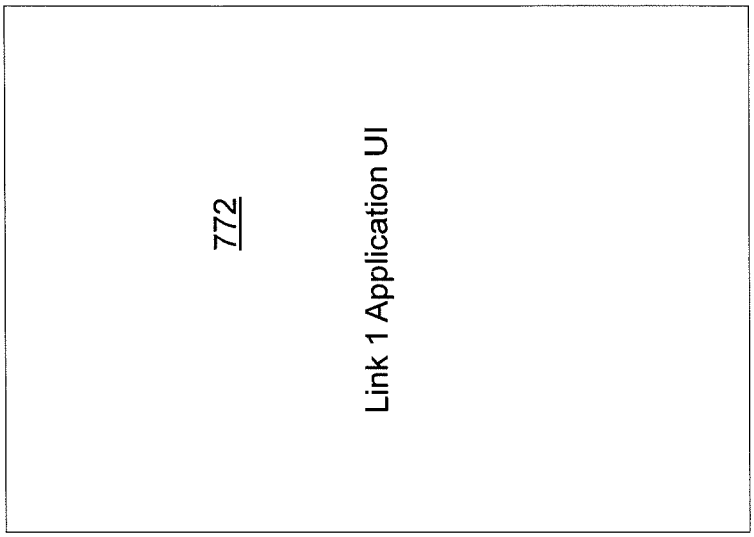

772
Link 1 Application UI

FIG. 11

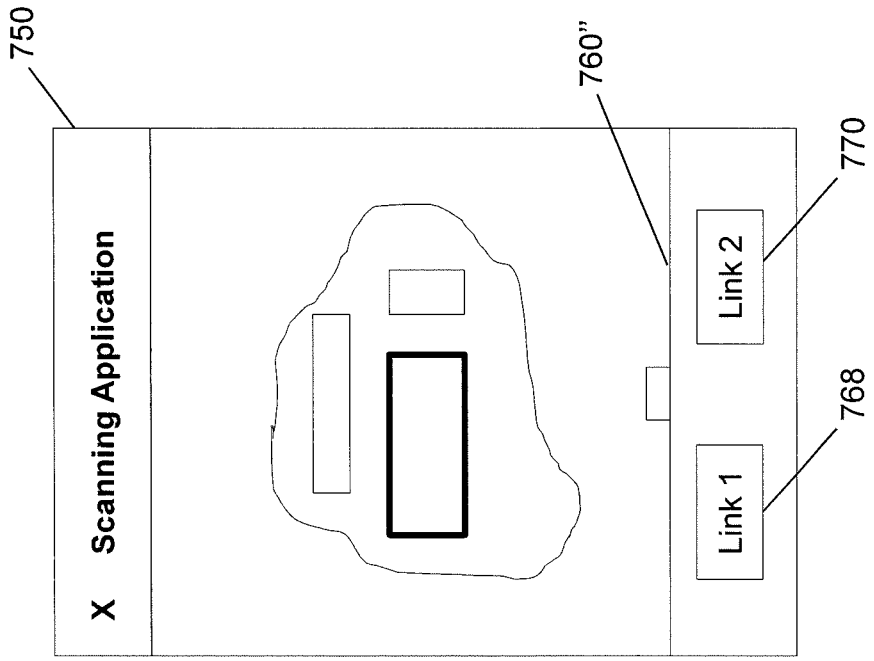

750
760"
770
768
X Scanning Application
Link 2
Link 1

FIG. 10

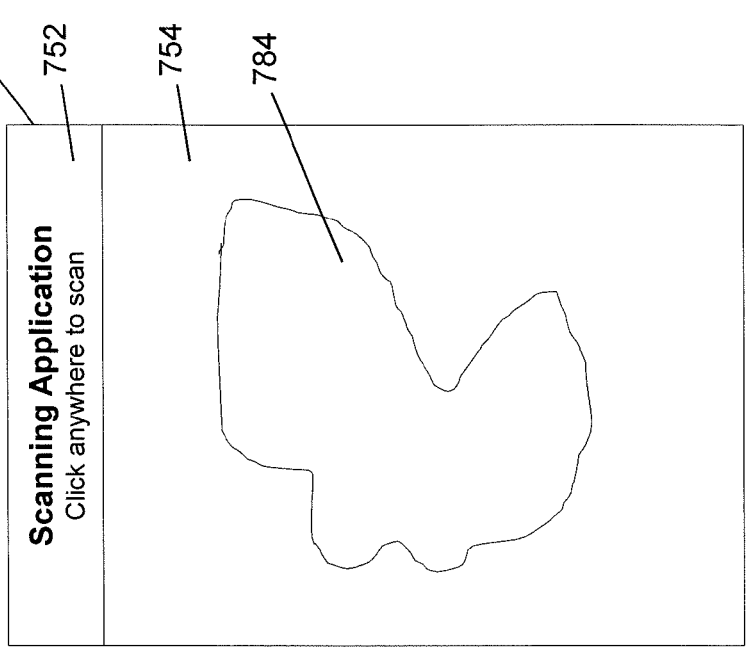

750
752
754
784
Scanning Application
Click anywhere to scan

FIG. 13

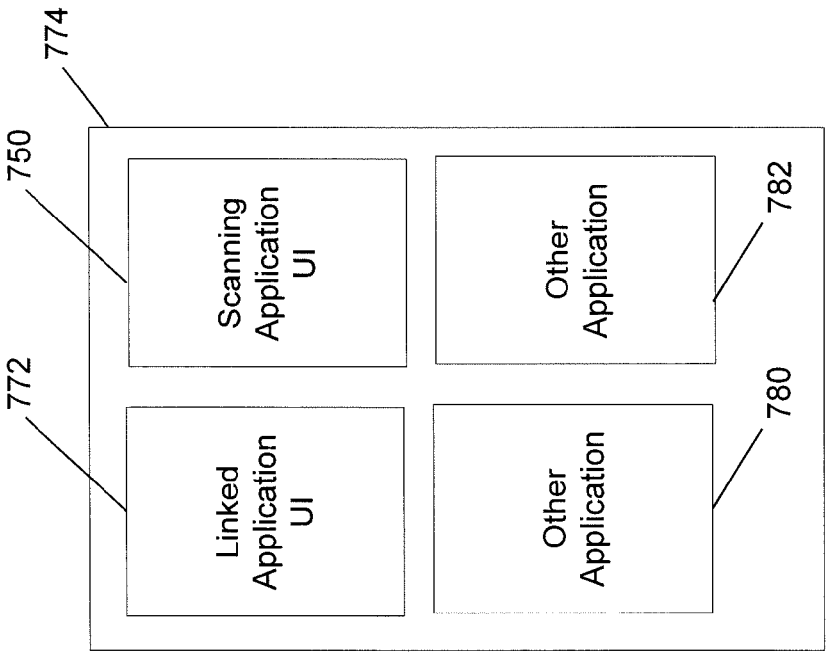

774
750
772
Scanning Application UI
Linked Application UI
Other Application
782
Other Application
780

FIG. 12

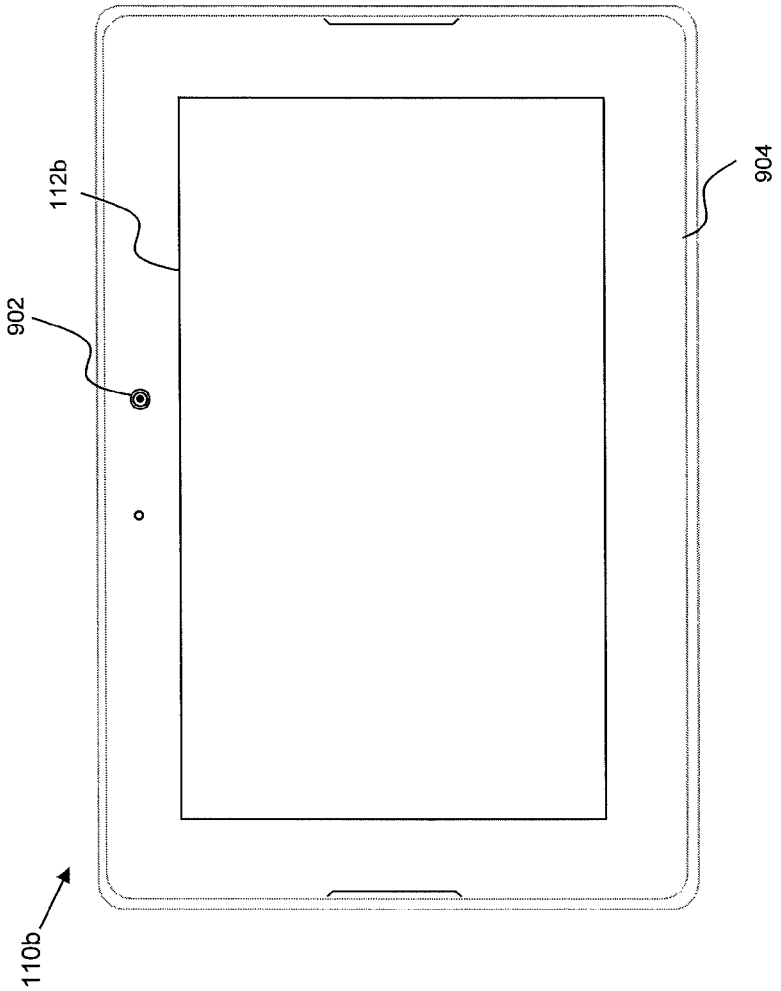


FIG. 15

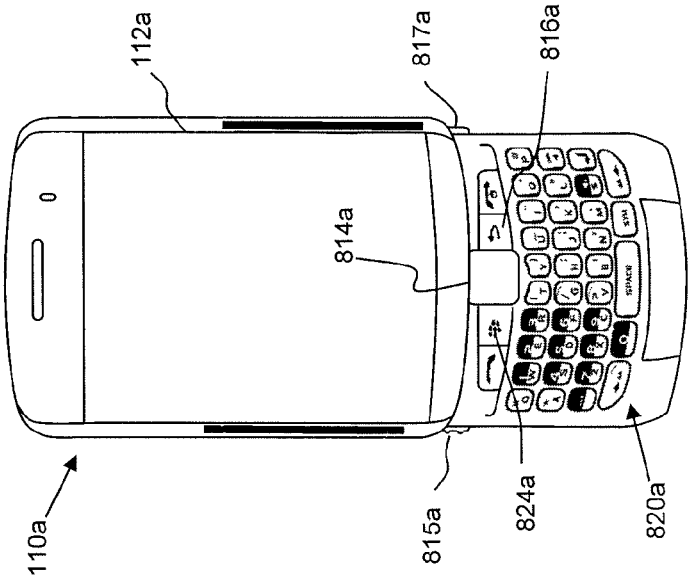


FIG. 14

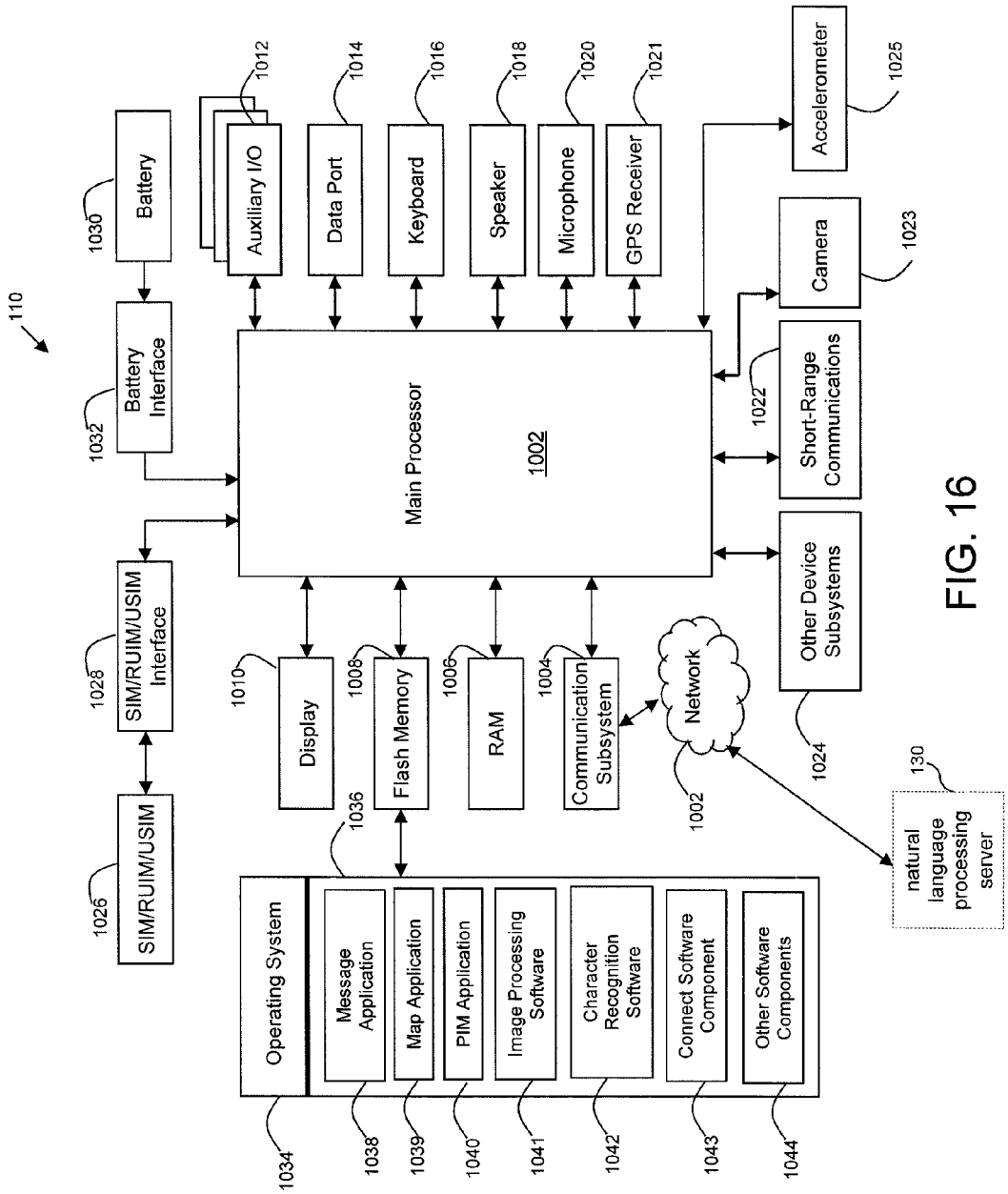

110
Battery
1030
Battery Interface
1032
SIM/RUIM/USIM Interface
1028
SIM/RUIM/USIM
1026
Auxiliary I/O
1012
Data Port
1014
Keyboard
1016
Speaker
1018
Microphone
1020
GPS Receiver
1021
Accelerometer
1025
Camera
1023
Short-Range Communications
1022
Other Device Subsystems
1024
Main Processor
1002
Display
1010
Flash Memory
1008
RAM
1006
Communication Subsystem
1004
Network
1002
natural language processing server
130
Operating System
1034
Message Application
1038
Map Application
1039
PIM Application
1040
Image Processing Software
1041
Character Recognition Software
1042
Connect Software Component
1043
Other Software Components
1044
1036

FIG. 16

METHODS AND APPARATUS RELATING TO TEXT ITEMS IN IMAGES

TECHNICAL FIELD

The following relates generally to methods and apparatus relating to text items in images and in particular to performing, by an electronic device, an action relating to text scanned by the electronic device.

BACKGROUND

Many electronic devices, including mobile devices, include a camera in which an image or video can be captured and an optical character recognition application in which text is determined from an image or a video. The inventors have identified that it would be useful for an electronic device to perform an action in relation to text determined from an image or a video.

BRIEF DESCRIPTION OF THE DRAWINGS

Example embodiments will now be described by way of example only with reference to the appended drawings wherein:

FIG. **1-4** illustrate a system configured to perform an action based on text determined in an image or video scanned by an electronic device, according to an example embodiment.

FIG. **2** illustrates rectangles drawn by an electronic device, according to an example embodiment.

FIG. **3** illustrates an electronic device, displaying in its display, selectable icons, each of the icons corresponding to an action corresponding to an item type of a text item, according to an example embodiment.

FIG. **4** illustrates an electronic device, displaying in its display, text items and a menu of selectable actions, corresponding to an item type of a text item, according to an example embodiment.

FIG. **5** is a flow diagram of processor or computer executable instructions for an electronic device to perform an action based on scanned text, according to an example embodiment.

FIG. **6** is a flow diagram of processor or computer executable instructions for an electronic device to perform image processing, according to an example embodiment.

FIG. **7** is a flow diagram of processor or computer executable instructions for an electronic device to perform scanning, according to an example embodiment.

FIG. **8** is a screen shot of an example of a user interface for a scanning application during a scanning operation.

FIG. **9** is a screen shot of an example of a user interface for a scanning application subsequent to a scanning operation.

FIG. **10** is a screen shot of a user interface for a scanning application subsequent to a scanning operation and displaying links associated with content determined during the scanning operation.

FIG. **11** is a screen shot of a user interface for a linked application.

FIG. **12** is a screen shot of a user interface for a tiled collection of active applications.

FIG. **13** is a screen shot of an example of a user interface for a scanning application prior to a scanning operation.

FIGS. **14-15** are plan views of electronic devices and display screens therefor, according to example embodiments.

FIG. **16** is a block diagram of an electronic device, according to an example embodiment.

DETAILED DESCRIPTION

It will be appreciated that for simplicity and clarity of illustration, where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the example embodiments described herein. However, it will be understood by those of ordinary skill in the art that the example embodiments described herein may be practised without these specific details. In other instances, well-known methods, procedures and components have not been described in detail so as not to obscure the example embodiments described herein. Also, the description is not to be considered as limiting the scope of the example embodiments described herein.

FIGS. **1-4**, illustrate a system configured to perform an action based on text determined in an image or video scanned by an electronic device **110**, according to an example embodiment. The electronic device **110** is optionally communicatively connected to a natural language processing server **120**.

The device **110** includes a camera, which captures an image of poster **120**. The camera is also configured to capture a frame of a video. It can be appreciated that the following principles also apply to images that are received, accessed from storage, or otherwise obtained by the device **110**. The device **110** temporarily stores the image or video frame in a buffer of the camera, so that the device **110** can further process the image or video frame.

Device **110** applies to the image or video frame, image processing techniques, to enhance recognition of text items in the image or video frame. Through an image processing technique called thresholding (a technique that is known to one skilled in the art), the device **110** boosts the contrast in the image or video frame, to bring out potential text items. In an example embodiment, the image processing techniques may be performed by image processing software (**1141** of FIG. **11**) of device **110**, such as for example, Leptonica software, which is integrated into the Tesseract software suite.

As illustrated in FIG. **2**, the device **110** detects edges of potential text items and draws rectangles **200** (or squares, or other boundary defining shapes) around the potential text items that are to be later scanned for text. By drawing the rectangles, only specific areas within the image will be scanned. In an example embodiment, the detection of edges of potential text items may be performed by image processing software (**1141** of FIG. **11**) of device **110**, such as for example, OpenCV software. Example alternatives to OpenCV include, without limitation, FastCV (open source), LibCCV (open source), and Dacuda (commercially available).

Optionally, as an optimization step, the device **110** determines the boundaries of each rectangle and combines overlapping rectangles into larger rectangles to reduce the amount of fragmented text spans, Since the number of rectangles to be scanned would be reduced, scanning performance would be improved.

The device **110** scans each of the rectangles **200**, to identify any text items that may be in the rectangle. A text item can be defined as having at least one character (including alphabetic characters, characters specific to a foreign language, numbers, symbols (e.g., stock symbols) and spaces). As a text item can be at least one character, a text item can include a single character, a word or multiple words. In an example embodiment, the detection of edges of potential text items may be performed by character recognition software (**1142** of FIG. **11**) of device **110**, such as optical character recognition software, such as for example, Tesseract software. Example alternatives to Tesseract include, without limitation, Abbyy (com-

mercially available), OCR Shop XTR (commercially available), Ocropus (open source), and Cuneiform (open source).

Sometimes scanning is not optimally performed, typically due to poor lighting conditions when a scan is performed. As a result, items can be misidentified as text items or identified text items are misspelled.

To improve scanning performance, optional methods may be used. For example, any misspelled text items may be corrected. The Levenshtein distance algorithm (which is known to one skilled in the art) for example, can be used to determine how similar the misspelled text item is to a word that has the correct spelling. If, after using the algorithm, the distance is small (or in other words the misspelled text item is similar to a word that has the correct spelling), the word with the correct spelling is used instead of the identified text item.

Another optional method to improve scanning performance is assigning a confidence level to a scan of a rectangle and any scans with a low confidence level are discarded.

Another optional method to improve scanning performance is to apply rules to discard identified text items that do not meet predetermined criteria. Example rules, which can be applied, are to discard the identified text item due to it not meeting such predetermined criteria are, if:

1) The word is too long, e.g. 20 characters long.
2) The word contains 3 or more identical characters
3) The word contains more punctuation than alphanumeric characters
4) The word contains three or more different punctuation characters (ignoring first and last characters)
5) The word contains five or more consecutive vowels or consonants (with exceptions)
6) The word contain more uppercase letters than lowercase letters (unless the word is all uppercase)
7) The word is a single letter that is not 'a' or 'I'
8) The word contains only alphabetical characters and has 8 times more vowels than consonants (or vice versa)

After any discarding of any items misidentified as text items, or correcting any misspelled identified text items, the device **110** determines an item type for at least some of the identified text items. An item type can be defined as a type or characterization of the text item and can include and is not limited to for example: a communication address (e.g. a phone number, an email address, an electronic device identification (e.g. a BlackBerry personal identification number (PIN)), an instant message address and a social networking (e.g. Twitter) address), a location, a name (e.g. of a person, organization, product, service, location, movie, entertainer, bus route), an element of calendar (e.g. a year, a month, a date and a time), an element of social networking (e.g. Twitter) topic, a uniform resource locator (URL) and a shipping tracking number, UPC codes, bar codes, QR codes, ASINs (Amazon product ids), item part/stock numbers, stock symbols, etc. The device can determine some item types (e.g. a communication address, an element of a calendar, an element of social networking, a URL and a shipping tracking number) by attempting to match a text item with a with predefined pattern, such as in regular expression pattern matching (which is known to one skilled in the art).

The device **110** also determines at least one action, corresponding to an item type of a text item.

Alternatively, the device **110** sends at least some of the identified text items to a natural language processing server **130** (of FIG. **1**) that is communicatively connected to the device. The device **110** may do this in the case where it cannot determine an item type for a particular text item. The server **130** determines an item type for at least some of the identified text items.

In an example embodiment, the server **130** determines the item types by using context surrounding or near the particular text item. For example, the server **130** receives from the device **110** the text items identified in the rectangles **200** of FIG. **2**. When processing the "BlackBerry" text item for example, the server looks at the text items occurring before and/or after the "BlackBerry" text item. For example, the server reviews the text items in sentence containing the "BlackBerry" text item. In another example, the server looks at a predetermined number of text items occurring before and/or after the "BlackBerry" text item. In either of these examples, the server **130** looks at the "company" text item, occurring before the "BlackBerry" text item and can determine that "BlackBerry" relates to the item type of a name company. In another example embodiment, the device **110** similarly determines the item types by using context surrounding or near the particular text item.

In another example embodiment, the server **130** is populated with various information and databases, which it uses to determine an item type for a text item. Example information and databases are: a business names database, a white list of known data, Wikipedia data, a TV and movie database (e.g. the Internet Movie Database), and a database of artists and entertainers. For example, when processing the "Seattle" text item identified in the rectangles **200** of FIG. **2**, the server uses Wikipedia data to determine that "Seattle" relates to the item type of a location. In another example embodiment, the device **110** is populated with the various information and databases, which it uses to determine an item type for a text item.

The server **130** also determines at least one action, corresponding to the item type, and sends the determined actions to the device **110**.

The device **110** provides a user interface to allow a user to select an action corresponding to an item type of a text item. FIGS. **3** and **4** illustrate these user interfaces, according to example embodiments.

FIG. **3** illustrates the device **110**, displaying in its display **300**, user interface elements that are selectable icons **310**, **320**, **330**, **340** and **350**, each of the icons corresponding to an action corresponding to an item type of a text item, according to an example embodiment. The selectable icons are displayed adjacent to or near to the corresponding text item and include an arrow pointing to the corresponding text item. For example, icon **310** is near to and points to text item "Seattle", icon **320** is near to and points to text item "BlackBerry", icon **330** is near to and points to text item "www.blackberry.com", icon **340** is near to and points to text item "the developers@blackberry.com" and icon **350** is near to and points to text item "425-208-0620"

Icon **310** is a mapping icon, corresponding to a location item type, for the text item "Seattle". Upon receiving selection of icon **310**, device **110** can e.g. display Seattle in a map in a map application (**1038** of FIG. **10**) of device **110**.

Icon **320** is a contact icon, corresponding to a name item type for the text item "BlackBerry". Upon receiving selection of icon **320**, device **110**, can e.g. create a contact entry, with "BlackBerry" for the contact name, in a Personal Information Manager (PIM) application (**1040** of FIG. **10**) of device **110**.

Icon **330** is an information icon, corresponding to a URL item type, for the text item "www.blackberry.com". Upon receiving selection of icon **330**, device **110** can e.g. launch a web browser of device **110**, with the URL "www.blackberry.com",

Icon **340** is a messaging icon, corresponding to the communication address item type, for the text item "thedevelopers@blackberry.com". Icon **350** is a phone icon, corresponding to the phone number item type, for the text item "425-208-0620". Upon receiving selection of icon **340**, device **110** can e.g. call the phone number "425-208-0620".

FIG. **4** illustrates another user interface to allow a user to select an action corresponding to an item type of a text item. Specifically, FIG. **4** illustrates the device **110**, displaying in its display **400**, text items **410** and **430**, and a user interface element that is a menu **440** of selectable actions, corresponding to an item type of a text item, according to an example embodiment. Menu **440** is near to and points to text item **430**.

In this example embodiment, text items **410**, **420** and **430** are shown in the form of user interface elements of italics and underlined text. (In other example embodiments, the text items can be shown in the form of other user interface elements, such as highlighted text.) Text items **410**, **420** and **430** are also hyperlinked, such that upon the device **110** receiving selection of one of the text items, the device displays a menu of selectable actions, corresponding to the item type of the text item. For example, upon receiving selection of text item **430** (which is phone number "425-208-0620"), menu **440** is displayed, providing the selectable actions: "Obtain Caller ID for 425-208-0620", "Call 425-208-0620" and "Send a txt to 425-208-0620".

In another example embodiment, upon selection of one of the hyperlinked text items **410**, **420** and **430**, the device performs a default action. For example, upon the device **110** receiving selection of the "Seattle" text item **410**, the device performs a default action of displaying Seattle in a map application (**1039** of FIG. **10**) of the device.

Table 1 below lists actions that can be performed by the device **110**, corresponding to particular text types of text items, according to example embodiments. The actions can be performed in response to selection of a particular text item having a text type, or selection of a user interface element (e.g. icon, hyperlink, menu item and radio button) associated with a particular text item.

TABLE 1

Text Type	Example Actions That Can Be Performed by the Electronic Device
Phone number	Obtain the caller ID for the phone number Call the phone number Send a text message to the phone number Create a contact in the electronic device's PIM application with the phone number
Email address	Send an email to the email address Look up the email address in the electronic device's PIM application, to find the corresponding contact Create a contact in the electronic device's PIM application with the email address
Electronic device identification (e.g. BlackBerry PIN)	Create a contact in the electronic device's PIM application with the electronic device identification Initiate a communication with the electronic device associated with the electronic device identification
Name of a person	Create a contact in the electronic device's PIM application with the person's name Launch a web browser or app of the electronic device, to look up the person's name in e.g. Google, Wikipedia, LinkedIn. or Facebook View the electronic device's PIM application entry associated with the person's name Call, email, send a text message, or send an instant message to the contact associated with the person's name
Date or time	Add an entry in the electronic device's calendar, with the date or time. Include in an entry in the electronic device's calendar, contextual information in the text item that includes the date or time Add a reminder in a reminder application at a user-specified period ahead of the date or time
Name of an organization	Create a contact in the electronic device's PIM application with the organization's name Launch a web browser application of the electronic device, with the web site of the organization Sign up for offers, offered by the organization Obtain information about the organization, using a service (e.g. Yelp, Open Table) Obtain deals offered by the organization, using a service (e.g. Groupon) Launch a web browser or app of the electronic device, to look up the organization in e.g. Google, Wikipedia, LinkedIn, or Facebook
Name of a product	Sign up for offers regarding the product Locate a nearby store that carries the product Launch a web browser or app of the electronic device, to look up the product in e.g. Google, Wikipedia, Wolfram Alpha
Name of a service	Locate nearby providers of the service
Name of a movie or entertainer	Find show times Order tickets Look up reviews
Name of a bus route	Look up the schedule associated with the bus route.
Social networking (e.g. Twitter) topic	Launch a web browser or app of the electronic device, to search for the topic in the social networking web page or app
Social networking (e.g. Twitter) address	Launch a web browser with the social networking web page or the social networking app, to follow the person associated with the address
URL	Launch a web browser with the URL
Location	View the location in a map application of the device Get directions to the location using a map application of the device
Shipping tracking number	Launch a web browser (with the shipper's web page) or the shipper's app, to look up the status of the shipment associated with the shipping tracking number

FIG. **5** is a flow diagram of processor or computer executable instructions of a method **500** for device **110** to perform an action based on scanned text, according to an example embodiment. (Additional details of method **500** are discussed in the discussion of FIGS. **1-4**.) At **510**, an image of a frame or a video is captured. At **520**, at least one image processing technique is applied to the image or video frame. (Details of image processing techniques, according to an example embodiment, are discussed in the discussion of FIG. **6**.) At **530**, the image or video frame is scanned to identify any text items. (In an example embodiment, rectangles around potential text items in the image or video frame, are determined from the image processing techniques of FIG. **6**. These rectangles are scanned to identify any text items. Further processing of the rectangles, is discussed in the discussion of FIG. **7**.) At **540**, an item type is determined for at least some of the identified text items. Furthermore, actions corresponding to the item types are determined. At **550**, selectable icons are displayed. Each of the icons corresponds to each of the actions determined at block **540**. At **560**, a selection of one of the selectable icons is received at device **110**. At **570**, the device **110** performs the action corresponding to the selectable icon received at **560**.

In the case where the device captures a frame of a video (in **510**), **510-570** can be repeated by the device, for subsequent frames of the video captured by the device. By repeating **510-570** for each frame of a video, the device performs real-time processing of any text items in the video frames.

FIG. **6** is a flow diagram of processor or computer executable instructions of a method **600** for device **110** to perform

image processing, according to an example embodiment. (Additional details of method **600** are discussed in the discussion of FIG. **2**.) At **610**, the contrast of the image or video frame is boosted, to bring out potential text items. At **620**, the device draws rectangles around the potential text items. **630** and **640** may be optionally performed by the device. At **630**, the device determines boundaries of each of the rectangles. At **640**, the device combines overlapping rectangles, to form larger rectangles.

FIG. **7** is a flow diagram of processor or computer executable instructions **700** for a method for device **110** to scan and process the rectangles around potential text items in the image or video frame, which were determined from the image processing techniques of FIG. **6**, according to an example embodiment. (Additional details of method **700** are discussed in the discussion of FIG. **2**.) At **710**, the rectangles are scanned for any text items. **720**, **730** and **740** may be optionally performed by the device. At **720**, the device assigns a confidence score to each scan of a rectangle. Furthermore, the device discards any scans with a low confidence score. At **730**, the device corrects any misspellings in the text items. At **740**, the device discards any text items which do not meet predetermined criteria, e.g. such that they do not make sense.

FIGS. **8-13** illustrate an example user interface workflow for an application utilizing the image processing software **1041** and/or the character recognition software **1042** (see also FIG. **16**). FIG. **8** illustrates an example screen shot of a scanning application **750**, which includes a header **752** indicating that content **756** visible within a viewing portion **754** may be scanned by applying an input to the viewing portion **754**, by "clicking anywhere to scan". In this example, when the content **756** becomes visible within the viewing portion **754**, a touch input **758** triggers or otherwise initiates a scanning of the content **756**, e.g. as discussed above, in order to identify text items **756***a*, **756***b*, **756***c* as shown in FIG. **9**. FIG. **8** also illustrates a footer **760** that may provide a status bar **762** during a scanning/analysis process.

Once the scanning is complete, the text items **756***a*, **756***b*, **756***c* may be highlighted, tagged or otherwise identified as shown in FIG. **9**. In the example shown in FIG. **9**, a selected text item **756***b* can have corresponding identifying information **766** displayed in an updated footer **760'**. A tab **764** may also be provided to enable an interaction with the footer **760'**, e.g., to expand the size of the footer **760'** to generate a further modified footer **760"** as shown in FIG. **10**. In this way, additional information such as links to other applications can be displayed. In FIG. **10**, a first link "Link **1**" **768** and a second link "Link **2**" are displayed, each being associated with another application. This allows, for example, a detected phone number to initiate either a voice call, or a text message. Similarly, a link can be generated that launches a search engine to perform a web-based search. The web-search link may be advantageous for text items that cannot be associated with a particular application, e.g. general text.

FIG. **11** illustrates an application UI **772** for an application associated with Link **1**, which can be initiated by selecting the link **768** shown in FIG. **10**. It can be appreciated that the links displayed in the footer **760"** enable convenient navigation to other applications to perform an action based on the detected text item. FIG. **12** illustrates a further navigation to a "tiled" user interface showing multiple open applications, including the linked application UI **772**, the scanning application UI **750**, and in this example two other applications **780**, **782**. After interacting with the linked application UI **772** as shown in FIG. **11**, the scanning application UI **750** may be selected from the screen **774** shown in FIG. **12** to navigate back to the scanning application UI **750** to begin another scan, e.g., for new content **784** visible in the viewing portion **754**.

Examples of applicable electronic devices may include, without limitation, cellular phones, smart-phones, tablet computers, pagers, wireless organizers, personal digital assistants, computers, laptops, handheld wireless communication devices, wirelessly enabled notebook computers, portable gaming devices, and the like. Such devices will hereinafter be commonly referred to as "electronic devices" **110** for the sake of clarity. It will however be appreciated that the principles described herein are also suitable to other electronic devices, not listed here.

In an example embodiment, the electronic device **110** can be a two-way communication device with advanced data communication capabilities including the capability to communicate with other electronic devices or computer systems through a network of transceiver stations. The electronic device may also have the capability to allow voice communication. Depending on the functionality provided by the electronic device, it may be referred to as a data messaging device, a two-way pager, a cellular telephone with data messaging capabilities, a wireless Internet appliance, or a data communication device (with or without telephony capabilities).

Referring to FIGS. **14** and **15**, one example embodiment of an electronic device **110***a* is shown in FIG. **14** and another example embodiment of an electronic device **110***b* is shown in FIG. **15**. It will be appreciated that the numeral "**110**" will hereinafter refer to any electronic device **110**, including the example embodiments **110***a* and **110***b*, those example embodiments enumerated above or otherwise. It will also be appreciated that a similar numbering convention may be used for other general features common between all figures such as a touch-screen display **102**.

The electronic device **110***a* shown in FIG. **14** includes a touch-screen display **102***a* and a cursor or positioning device, which in this example is in the form of a track pad **814***a*. Track pad **814***a* permits multi-directional positioning of a selection cursor **8** such that the selection cursor can be moved in an upward direction, in a downward direction and, if desired and/or permitted, in any diagonal direction. The track pad **814***a* in this example embodiment is situated on the front face of a housing for electronic device **110***a* as shown in FIG. **14** to enable a user to manoeuvre the track pad **814***a* while holding the electronic device **110***a* in one hand. The track pad **814***a* may serve as another input member (in addition to a directional or positioning member) to provide selection inputs to the processor **1002** (see FIG. **16**) and can preferably be pressed in a direction towards the housing of the electronic device **110***b* to provide such a selection input. It will be appreciated that the track pad **814***a* is only one example embodiment of a suitable positioning device. For example, a track ball, touch-screen display, optical track pad, or other input mechanism may equally apply.

The touch-screen display **112***a* may display a selection cursor that depicts generally where the next input or selection will be received. The selection cursor may include a box, alteration of an icon or any combination of features that enable the user to identify the currently chosen icon or item. The electronic device **110***a* in FIG. **14** also includes a programmable convenience button **815***a* to activate a selection application such as, for example, a calendar or calculator. Further, electronic device **110***a* also includes an escape or cancel button **816***a*, a camera button **817***a*, a menu or option button **824***a* and a keyboard **820***a*. The camera button **817***a* is able to activate photo and video capturing functions, e.g. when pressed in a direction towards the housing. The menu or

option button **824***a* can be used to load a menu or list of options on the display **112***a* when pressed. In this example embodiment, the escape or cancel button **816***a*, the menu option button **824***a*, and a keyboard **820***a* are disposed on the front face of the electronic device housing, while the convenience button **815***a* and camera button **817***a* are disposed at the side of the housing. This button placement enables a user to operate these buttons while holding the electronic device **110***a* in one hand. The keyboard **820***a* is, in this example embodiment, a standard QWERTY keyboard, however, it will be appreciated that reduced QWERTY or virtual keyboards (e.g. as provided by a touch-screen display) may equally apply

The example electronic device **110***b* shown in FIG. **15** includes a touch-screen display **112***b*, a front camera **902**, and a touch-sensitive frame **904**. The touch-screen display **112***b* serves as the position device to provide an input mechanism in addition to display capabilities. The touch-sensitive frame also provides another input mechanism, for example, to control menu options of the electronic device **110***b*.

It will be appreciated that for the electronic device **110**, a wide range of one or more positioning or cursor/view positioning mechanisms such as a touch/track pad, a positioning wheel, a joystick button, a mouse, a touch-screen, a set of arrow keys, a tablet, an accelerometer (for sensing orientation and/or movements of the electronic device **110** etc.), OLED, or other whether presently known or unknown may be employed. Similarly, any variation of keyboard **820** may be used. It will also be appreciated that the electronic devices **110** shown in FIGS. **14** and **15** are for illustrative purposes only and various other electronic devices **110** are equally applicable to the following example embodiments. Other buttons may also be disposed on the electronic device housing such as colour coded "Answer" and "Ignore" buttons to be used in telephonic communications.

To aid the reader in understanding the structure of the electronic device **110**, reference will now be made to FIG. **16**.

FIG. **16**, shows therein is a block diagram of an example embodiment of an electronic device **110**. The electronic device **110** includes a number of components such as a main processor **1002** that controls the overall operation of the electronic device **110**. Main processor **1002** is directly or indirectly connected to the components of the electronic device **110**, as shown in FIG. **16**. Communication functions, including data and voice communications, are performed through a communication subsystem **1004**. The communication subsystem **1004** receives messages from and sends messages to a wireless network **502**. In this example embodiment of the electronic device **110**, the communication subsystem **1004** is configured in accordance with the Global System for Mobile Communication (GSM) and General Packet Radio Services (GPRS) standards, which is used worldwide. Other communication configurations that are equally applicable are the 3G and 4G networks such as EDGE, UMTS and HSDPA, LTE, Wi-Max etc. New standards are still being defined, but it is believed that they will have similarities to the network behaviour described herein, and it will also be understood by persons skilled in the art that the example embodiments described herein are intended to use any other suitable standards that are developed in the future. The wireless link connecting the communication subsystem **1004** with the wireless network **1002** represents one or more different Radio Frequency (RF) channels, operating according to defined protocols specified for GSM/GPRS communications.

The main processor **1002** is also communicatively connected to and interacts with additional subsystems such as a Random Access Memory (RAM) **1006**, a flash memory **1008**, a touch-screen display **1010**, an auxiliary input/output (I/O) subsystem **1012**, a data port **1014**, a keyboard **1016**, a speaker **1018**, a microphone **1020**, a GPS receiver **1021**, short-range communications **1022**, a camera **1023**, a accelerometer **1025** and other device subsystems **1024**. Some of the subsystems of the electronic device **110** perform communication-related functions, whereas other subsystems may provide "resident" or on-device functions. By way of example, the display **1010** and the keyboard **1016** may be used for both communication-related functions, such as entering a text message for transmission over the network **1002**, and device-resident functions such as a calculator or task list.

The electronic device **110** can send and receive communication signals over the wireless network **1002** after required network registration or activation procedures have been completed. Network access is associated with a subscriber or user of the electronic device **110**. To identify a subscriber, the electronic device **110** may use a subscriber module component or "smart card" **1026**, such as a Subscriber Identity Module (SIM), a Removable User Identity Module (RUIM) and a Universal Subscriber Identity Module (USIM). In the example embodiment shown, a SIM/RUIM/USIM **1026** is to be inserted into a SIM/RUIM/USIM interface **1028** in order to communicate with a network. Without the component **1026**, the electronic device **110** is not fully operational for communication with the wireless network **1002**. Once the SIM/RUIM/USIM **1026** is inserted into the SIM/RUIM/USIM interface **1028**, it is connected to the main processor **1002**.

The electronic device **110** is typically a battery-powered device and includes a battery interface **1032** for receiving one or more rechargeable batteries **1030**. In at least some example embodiments, the battery **1030** can be a smart battery with an embedded microprocessor. The battery interface **1032** is coupled to a regulator (not shown), which assists the battery **1030** in providing power to the electronic device **110**. Although current technology makes use of a battery, future technologies such as micro fuel cells may provide the power to the electronic device **110**.

The electronic device **110** also includes an operating system **1034** and software applications and components **1036**. The operating system **1034** and the software applications and components **1036** that are executed by and configure the main processor **1002** are typically stored in a persistent store such as the flash memory **1008**, which may alternatively be a read-only memory (ROM) or similar storage element (not shown). Those skilled in the art will appreciate that portions of the operating system **1034** and the software applications and components **1036**, such as specific device applications, or parts thereof, may be temporarily loaded into a volatile store such as the RAM **1006**. Other software components can also be included, as is well known to those skilled in the art.

The subset of software applications **1036** that control basic device operations, including data and voice communication applications, may be installed on the electronic device **110** during its manufacture. Software applications may include a message application **1038**, a map application **1039**, a personal information manager (PIM) application **1040**, image processing software **1041**, character recognition software **1042**, a connect software component **1043** and other software components **1044**. A message application **1038** can be any suitable software program that allows a user of the electronic device **110** to send and receive electronic messages, wherein messages are typically stored in the flash memory **1008** of the electronic device **110**. A PIM application **1040** includes functionality for organizing and managing data items of interest to the user, such as, but not limited to, e-mail, contacts, calendar

events, and voice mails, and may interact with the wireless network **1002**. Image processing software **1041** can implement the image processing method **600** of FIG. **6**. Character recognition software **1042** can implement the scanning method **700** of FIG. **7**. A connect software component **1043** implements the communication protocols that are required for the electronic device **110** to communicate with the wireless infrastructure and any host system, such as an enterprise system, that the electronic device **110** is authorized to interface with.

Other types of software applications or components **1044** can also be installed on the electronic device **110**. These software applications **1044** can be pre-installed applications (i.e. other than message application **1038**) or third party applications, which are added after the manufacture of the electronic device **110**. Examples of third party applications include games, calculators, utilities, etc.

The additional applications **1044** can be loaded onto the electronic device **110** through at least one of the wireless network **1002**, the auxiliary I/O subsystem **1012**, the data port **1014**, the short-range communications subsystem **1022**, or any other suitable device subsystem **1024**.

The data port **1014** can be any suitable port that enables data communication between the electronic device **110** and another computing device. The data port **1014** can be a serial or a parallel port. In some instances, the data port **1014** can be a USB port that includes data lines for data transfer and a supply line that can provide a charging current to charge the battery **1030** of the electronic device **110**.

For voice communications, received signals are output to the speaker **1018**, and signals for transmission are generated by the microphone **1020**. Although voice or audio signal output is accomplished primarily through the speaker **1018**, the display **1010** can also be used to provide additional information such as the identity of a calling party, duration of a voice call, or other voice call related information.

It will be appreciated that any module or component exemplified herein that executes instructions or operations may include or otherwise have access to computer readable media such as storage media, computer storage media, or data storage devices (removable and/or non-removable) such as, for example, magnetic disks, optical disks, or tape. Computer storage media may include volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information, such as computer readable instructions, data structures, program modules, or other data, except transitory propagating signals per se. Examples of computer storage media include RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by an application, module, or both. Any such computer storage media may be part of the mobile device **110** or accessible or connectable thereto. Any application or module herein described may be implemented using computer readable/executable instructions or operations that may be stored or otherwise held by such computer readable media.

It will be appreciated that the examples and corresponding diagrams used herein are for illustrative purposes only. Different configurations and terminology can be used without departing from the principles expressed herein. For instance, components and modules can be added, deleted, modified, or arranged with differing connections without departing from these principles.

The steps or operations in the flow charts and diagrams described herein are just for example. There may be many variations to these steps or operations without departing from the spirit of the invention or inventions. For instance, the steps may be performed in a differing order, or steps may be added, deleted, or modified.

Although the above has been described with reference to certain specific example embodiments, various modifications thereof will be apparent to those skilled in the art as outlined in the appended claims.

The invention claimed is:

1. A method performed by an electronic device, comprising:
obtaining an image;
applying to the image at least one image processing technique;
scanning the image to identify a text item;
determining an item type for the identified text item; and
determining an action, corresponding to the item type.

2. The method of claim **1**, further comprising:
displaying a user interface element, corresponding to the action;
receiving a selection of the user interface element; and
performing the action.

3. The method of claim **1**, wherein the at least one image processing technique comprises:
boosting contrast in the image, to bring out potential text items; and
drawing rectangles around the potential text items.

4. The method of claim **1**, wherein the at least one image processing technique comprises:
performing thresholding on the image, to bring out potential text items; and
drawing rectangles around the potential text items.

5. The method of claim **3**, further comprising:
determining boundaries for each of the rectangles; and
combining overlapping rectangles, to form larger rectangles.

6. The method of claim **3**, wherein the scanning of the image, comprises scanning the rectangles for any text items.

7. The method of claim **6**, further comprising:
assigning a confidence score to each scan; and
discarding any scans with a low confidence score.

8. The method of claim **7**, further comprising correcting any misspellings in the text items.

9. The method of claim **7**, further comprising discarding any text items that do not meet at least one predetermined criterion.

10. The method of claim **1**, wherein the image is obtained from a frame of a video.

11. An electronic device to perform an action based on scanned text, comprising:
a display; and
a processor configured to:
obtain an image;
apply to the image at least one image processing technique;
scan the image to identify a text item;
determine an item type for the identified text item; and
determine an action, corresponding to the item type.

12. The electronic device of claim **11**, wherein the processor is further configured to:
display a user interface element, corresponding to the action;
receive a selection of the user interface element; and
perform the action.

13. The electronic device of claim 11, wherein the at least one image processing technique comprises:

boosting contrast in the image, to bring out potential text items; and

drawing rectangles around the potential text items.

14. The electronic device of claim 11, wherein the at least one image processing technique comprises:

performing thresholding on the image, to bring out potential text items; and

drawing rectangles around the potential text items.

15. The electronic device of claim 13, wherein the processor is further configured to:

determine boundaries for each of the rectangles; and

combine overlapping rectangles, to form larger rectangles.

16. The electronic device of claim 13, wherein the scanning of the image, comprises scanning the rectangles for any text items.

17. The electronic device of claim 16, wherein the processor is further configured to:

assign a confidence score to each scan; and

discard any scans with a low confidence score.

18. The electronic device of claim 16, wherein the processor is further configured to correct any misspellings in the text items.

19. The electronic device of claim 16, wherein the processor is further configured to discard any text items that do not meet at least one predetermined criterion.

20. The electronic device of claim 11, wherein the image is obtained from a frame of a video.

21. A computer readable storage medium comprising computer executable instructions to perform an action based on scanned text, comprising:

obtaining an image;

applying to the image at least one image processing technique;

scanning the image to identify a text item;

determining an item type for the identified text item; and

determining an action, corresponding to the item type.

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